

## REMARKS

### *General:*

Claims 1-20 were pending in the application. Claims 12-20 were withdrawn from consideration, and are canceled by this amendment. Claims 1-11 stand rejected. Claims 1-11 are pending after this amendment. No new matter has been added by this amendment.

### *Abstract:*

The abstract as originally filed may be found on the cover page of the PCT published application. A copy of the abstract on a separate page is filed herewith. As set forth above, the opportunity has been taken to make minor changes to the abstract, mostly to conform to United States English orthography.

### *Sufficiency:*

The examiner states that a "rejection is based on the fact that the Applicant presents a complicated formula for the derivation of fitness that is not well known in the art." It is respectfully pointed out that is not a proper basis for rejection. It is of the nature of an invention to involve matter that is not known in the art, and that matter may be as complicated as the invention requires. In point of fact, however, the structure factor analysis that is used to derive the covariance matrix would be known to those skilled in the art. Attached is a copy of a paper delivered at a workshop in 1999, from which it appears that competing methods of structure factor analysis have been available for about 20 years.

The examiner further contends that "the threshold values that are employed could result in a divergent product selection." It is respectfully pointed out that the sole purpose of the threshold (see claim 1, at page 19, lines 16-19) is to terminate the iterative process. It cannot affect whether the process converges or diverges. As will be seen from Figs. 6 and 7b, in practice the fitness value initially improves rapidly and later levels off. Of course, the actual value of  $\chi^2$  at which the fitness value levels off, and thus the optimum threshold value, must be determined for the individual crystal, but that is easily within the ability of the skilled person.

With respect to the examiner's remarks concerning the "predetermined unit cell and space group," the terms "unit cell" and "space group" are of course well-known in the art. Attached are definitions from a general technical dictionary. As noted at page 7, line 13, methods for the determination of the correct unit cell and space group are conventional, and it was therefore deemed more elegant to treat the unit cell and space group as predetermined data, rather than to recite the determination as an initial method step.

With reference to claim 5, the examiner contends that "the claim does not provide enough information for deduction of the specific values of [certain] variables." As the examiner herself points out, the claim does not have to provide an enabling disclosure: that is what the specification is for. For any given trial structure, the calculation of the structure factor intensities  $F$  is of course completely routine. As noted at page 7, lines 19-26, methods of extraction of the structure factor intensities and covariance matrix from the experimental powder diffraction data are also known to the person skilled in the art. The only remaining task is to select the initial trial structures. As is explained at page 10, lines 19-23, these may be generated at random, so no further teaching is necessary. (In practice, however, it should be within the skill and judgment of the crystallographer to select better-than-random initial trial structures.) In subsequent generations, the actions of the survivor selector (see page 11, line 31 to page 12, line 9) and breeder (see page 12, lines 17-27) or other means for selecting and altering survivors are deliberately left fairly open. The skilled crystallographer may wish to adjust them to optimize the process to particular crystals, which is well within the ability of the skilled person.

With reference to the breadth of claims 1-4 and 6-11, the formula recited in claim 5 is the best mode contemplated by the inventor at the date of filing, as required by 35 U.S.C. §112, but is of course not the only possible mode of carrying out the present invention. It is clear from the wording of claim 1 that the "fitness" must be a meaningful quantitative measure of how different the given trial structure is from the experimental diffraction pattern. The choice of a specific definition of fitness is not essential to the present invention in its broadest sense, as recited in claim 1. It is entirely within the discretion of the skilled user, and within the proper scope of the present invention, to substitute a different measure of fitness. See, for example, page 12 lines 10-16, where several possibilities are disclosed.

The simulated annealing procedure recited in claim 11 is described at page 15, line 15 to page 16, line 2. The examiner's §112, second paragraph, rejection of claim 11 is therefore believed to be incorrect.

***Formal drawings:***

Replacement drawings are filed herewith.

***Conclusion:***

For all of the above reasons, it is believed that claims 1-11 comply with the requirements of 35 U.S.C. § 112, and the examiner's other requirements have been met. Reconsideration of the examiner's rejections and an early notice of allowance of all claims are earnestly solicited.

Respectfully submitted,

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into the channel of a field-effect transistor with the emitter in a conventional bipolar

ice radiator.

(Comp) Program as written using a programming language; it must be assembled, compiled or before it can be executed. Also *source program* or *program*.

ance (ElecEng) See output impedance.

age (Comp) Language in which the program is

(ImageTech) The machine that plays the master on an edit suite, feeding the edit recorder.

im (Comp) See source code.

(NucEng) See start-up procedure.

nce (ElecEng) See internal resistance.

th (Radiol) Activity of radioactive source disintegrations per second.

'MinExt' Crude oil containing significant sulphur compounds, eg hydrogen sulphide gas, giving it an unpleasant odour. Hydrogen normally removed from the crude oil before sweet crude.

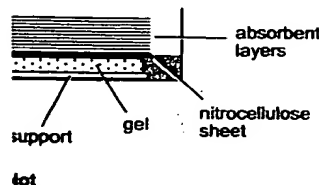
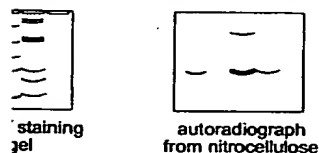
ist) Natural gas containing gaseous impurities: hydrogen sulphide ( $H_2S$ ), hydrogen cyanide (HCN) and carbon dioxide ( $CO_2$ ). Sour gas will normally be treated for these impurities before use. See scrubber.

s) The treatment of yarn or cloth with dilute alkali after an alkali process to ensure that no

(Sci) Literally, packed under vacuum. Generic term for food products which are vacuum packed for pasteurization. Foods are prepared at low temperatures, designed to ensure stability at below  $3^\circ C$  for about 6 weeks. Vacuum depends to a large extent on temperatures below  $3^\circ C$  during transport.

age (Min) See Transvaal jade.

(Biol) Method of revealing rare DNA fragments. A mixture of DNA. Gel electrophoresis fragments, usually made by cleavage with restriction enzymes, into their size classes. The fragments are separated by placing the gel in alkali after which a filter sheet is laid over the gel and the DNA is transferred from gel to filter by placing layers of paper above the latter (blotting), the gel being in a high concentration of salt. This causes the DNA fragments to diffuse through the nitrocellulose sheet, which the latter adsorb, maintaining their positions. The nitrocellulose sheet is then incubated in conditions with a solution containing molecules able to base-pair with some of the original DNA (probing). Finally, the probe is detected by autoradiography. The fragment size of the complementary DNA can be located by autoradiography. Named after its discoverer, E.M. Southern.



ern, it is one of the most powerful methods in molecular biology. Analogous methods for proteins and RNA are called western and northern blots. See panel on DNA and the genetic code.

Southern Cross (Astron) See Crux.

Southern Lights (Astron) See aurora.

southern oscillation (Meteor) A slow fluctuating exchange of air between the eastern tropical Pacific on the one hand, and the Indian Ocean and Indonesia on the other, with a corresponding negative correlation between annual mean pressure values over the two areas. The interval between corresponding points in successive cycles varies from one to five years, and the oscillation is linked to variations in sea-surface temperature and the pattern of rainfall.

southing (Surv) Measured difference southward from a reference latitude.

south pole (Phys) See pole.

sovlite (Chem) A laboratory apparatus for the continuous extraction of a solid substance with a solvent, consisting of a distillation flask, a reflux condenser, and a cylindrical vessel fitted between them to which a syphon system is attached.

sovlite (Min) A coarse-grained calcite carbonatite, commonly containing biotite and apatite.

soya flour (FoodSci) Rich source of vegetable protein (over 50%) in which all the essential amino acids are present and produced by milling de-fatted soybeans. Has good water binding properties and is used to improve the keeping and eating qualities of bakery products. Soya protein isolate has a protein content of around 90% and is used as a binder and emulsifier in sausages and similar products and in making vegetarian meat analogues.

Soyuz (Space) A one- to three-man vehicle used by the former USSR for ferrying crews to and from its orbital stations, first launched in 1967. Part of the spacecraft is a re-entry module used for the return to Earth, employing parachutes and rockets for the actual landing. See panel on Space station.

sp (Bot) Abbrevs for species (sing).

SP (Build) Abbrev for soil pipe.

space (Print) A keystroke less than type height and thinner than a quadrag; used to separate words and justify lines of type.

space (Genrl) The regions, sometimes with near-vacuum conditions, surrounding all bodies in the Universe. See panel on Space.

space (Telecomm) The period of time in transmission during which a Morse key is open, ie not in contact.

space charge (Electronics) As distinct from surface charge, the term applied to the local net charge when it is distributed through a finite volume, such as in the depletion region in a semiconductor device structure (p-n junction etc). Gradients in electrostatic fields are associated with regions of space charge.

space-charge limitation (Electronics) Condition in a thermionic valve when electron current leaving a cathode is limited by balance between attractive electric forces from other electrodes and repulsion within space charge. See Child-Langmuir equation.

space commercialization (Space) Exploitation of space and space-produced products by industry for profit.

spacecraft (Space) Vehicle containing all the necessary subsystems to support a payload for the performance of a particular space mission. It may be manned or unmanned. See panel on Space.

space current (Electronics) See thermionic current.

spaced antennas (Telecomm) Those used with diversity systems, or to enhance directivity.

spaced-loop direction-finder (Telecomm) One including two loops spaced sufficiently in terms of the wavelength to enhance their normal directivity, as exhibited by the polar diagram of response.

spaced slating (Build) Slating laid with gaps between adjacent slates in any course.

space dyeing (Textiles) Production of irregularly multi-

coloured yarns by applying various colours at intervals along a single yarn or pad of yarns often by a printing process.

space environment (Space) The extra-terrestrial conditions existing in a particular region between Earth and distant bodies. Specifically, it involves the phenomena of near vacua, fields, particles and related effects.

space factor (ElecEng) The ratio of the active cross-sectional area of an insulated conductor to the total area occupied by it.

space frame (Aero) Collection of connected struts, rods or wires which are stressed when whole assembly is stressed, eg trestle bridge, half-timbered cottage. Cf monocoque.

space group (Crystal) Classification of crystal lattice structures into groups with corresponding symmetry elements.

space junk (Space) Debris in space consisting of burned-out rocket stages and other man-made objects; most fragments are only a few centimetres across but present hazards to functional satellites and must be tracked by radar.

Spacelab (Space) Reusable orbital research laboratory which extends the space shuttle capabilities and is carried in its cargo bay; modular in construction it comprises a manned module and unmanned pallets, permitting module-only, pallet-only or mixed modes to be used.

space lattice (Crystal) Three-dimensional regular arrangement of atoms characteristic of a particular crystal structure. There are 14 such simple symmetrical arrangements, known as Bravais lattices. See symmetry class and panel on Crystal lattice.

space parallax (Acous) The difference in bearing between a moving object, such as a machine in flight, and the direction of arrival of the sound waves emitted by it. This arises from the comparable velocity of flight with that of the propagation of sound waves.

space parasite (Bot) A plant which inhabits intercellular spaces in another plant, obtaining shelter but possibly taking nothing else.

space programmes (Space) Peaceful and military projects in space; major contributors are the former USSR, the US, the European Space Agency (ESA), Japan and China. Unmanned programmes have produced communications and remote sensing satellites, as well as interplanetary surveys. Manned activities have resulted in Moon landings and extended stays in orbiting space stations. Emerging nations including Brazil, the Arab States, Pakistan, India and Indonesia have their own space activities. See panel on Space station.

space qualified (Space) Said of space systems, subsystems and components which meet the specifications relevant to their use in space.

space reactor (Space) Energy source of a nuclear-powered space vehicle. Previous designs have used radiation from enriched plutonium to provide heat which is then converted to electricity; small conventional fission reactors are also used.

space-reflection symmetry (Phys) See parity.

space research (Space) Investigation of the space environment and its effects, and its use as a vantage point for viewing the Earth and deep space. Generally, research which is performed with the aid of a space system.

space shuttle (Space) Manned ground-to-orbit and return transportation system first launched in 1981. See panel on Space.

space station (Space) Several manned modules and/or unmanned platforms, launched separately and then joined to form a base for a permanent presence in space. See panel on Space station.

space suit (Space) Specially designed suit which allows an astronaut to operate in a space environment. The design includes the provision of a pressurized oxygen supply, and provides for temperature control and the purification of exhaled gases. Also pressure suit.

space switching (Telecomm) Routing of calls from one

**del (Phys)** A model of the nucleus incorporating the features of both the collective model and the independent particle model.

**le (Chem)** The scale of atomic and molecular weights is based on the mass of the  $^{12}\text{C}$  isotope, taken as 12 exactly, hence the atomic mass is  $1/12 \times 10^{-27}$  kg. This scale was adopted by the International Union of Pure and Applied Chemistry, hence the name. See **atomic mass unit, atomic weight**.

**thread (Eng)** A screw-thread form adopted by the United Kingdom and the US. It combines features of the **Standard Screw-Thread** and the **British Standard Screw Thread**. Of 60° angle, the thread has flats and crests while the crests of the nut are flat.

**vergence (Maths)** (1) A sequence  $a_n(x)$  converges uniformly to the limit  $a(x)$  if, given any  $\epsilon > 0$ , there exists for all  $x$  in  $S$  that  $|a_n(x) - a(x)| < \epsilon$  when  $n \geq N$ . (2) A function converges uniformly if the sequence of partial sums converges uniformly. (3) A product converges uniformly if the partial products converge uniformly. See **M-test of Weierstrass for uniform convergence**.

**ion (Eng)** The plastic extension produced by the use of length of a tensile test piece before fracture commences, i.e. up to the stage when the load is reached. Thereafter further plastic deformation is confined to the region of the fracture measures.

**Maths** One which is described by the same laws. A constant field.

**sm (Geol)** The concept that the processes which modify the Earth today also operated in the past. In its more extreme form the concept allows of rates as well as of processes.

**ling** One with electric properties identical in length.

**TN** for a **widescreen**, high definition, standard component format using  $\frac{1}{2}$  in. interlaced.

**tivity (Phys)** The property of unipolar materials that they can flow in one direction only; exhibited by a diode.

**ance (Phys)** Any electrical or electronic device in which power can be transmitted unidirectionally, e.g. a thermionic valve or carbon microphone.

**Phys** Neutralization of feedback so that a system has a unilateral response, i.e. there is no feedback if the signal is applied to the output. In any valve circuits are inherently unilateral. Circuits require external neutralization.

**e (Eng)** A tolerance with dimensions above or entirely below the basic size. See **tolerance**.

**er (ElecEng)** One for which energy can be transferred forward.

**ng** a single compartment. Cf **bilocular**.

**Chem** See **monomolecular layer**.

**tion (Chem)** See **monomolecular layer**.

**s (Biol)** Each chromatid contains a double-helical molecule organized linearly along the chromosomal axis.

**move** an application with all its elements on a computer or a disk drive.

**or (ElecEng)** A conductor at earth potential. No care need be taken to insulate it.

**taining** one nucleus.

**ion** for pipes.

**and B**, the set of elements which are in both A and B.

**union (Med)** In the process of healing, the growing together of parts separated by injury (e.g. the two ends of a broken bone, the edges of a wound).

**union fabric (Textiles)** A woven fabric with the warp of one fibre (e.g. linen) and the weft of another (e.g. cotton).

**union kraft (Paper)** A packaging material comprising two layers of kraft paper bonded together by means of a laminant that is resistant to the transmission of water in liquid or vapour form (e.g. bitumen or polythene).

**uniparous (Zool)** Giving birth to one offspring at a time.

**Unipivot instrument (ElecEng)** An instrument whose moving-coil system is balanced on a single pivot passing through its centre of gravity.

**unipolar (Zool)** Said of nerve cells having only one process. Cf **bipolar, multipolar**.

**unipolar transistor (Electronics)** Transistor with one polarity of carrier.

**unipole antenna (Telecomm)** Isotropic antenna conceived as radiating uniformly in phase in all directions. Theoretically useful, but not realizable in practice. See **isotropic radiator**.

**unipotent (Zool)** Of embryonic cells, capable of forming a single cell type only. Cf **totipotent**.

**unique sequence DNA (Biol)** DNA sequences which are only represented once in the haploid genome. Most genes are in this category.

**uniramous (Zool)** Having only one branch, as some crustacean appendages. Cf **biramous**.

**uniselector (Telecomm)** A selector switch which only rotates its wipers about an axis, in contrast with the **two-motion selector**, in which wipers are raised to a specified level in the rows of contacts by the impulse trains, and then enter the bank of contacts, either by hunting or by a further train of impulses. See **selector**.

**uniseriate (Bot)** Arranged in a single row, series or layer.

**unisexual (Bot, Zool)** Showing the characters of one sex or the other; distinctly male or female. Cf **hermaphrodite**.

**unit (Genrl)** A dimension or quantity which is taken as a standard of measurement.

**unit (MinExt)** 1% of a specified element or compound in a parcel of ore, concentrates or metal being sold.

**unit arch (Print)** On a web-fed press a perfecting unit arranged in an arch or inverted U design.

**unit cell (Crystal)** The smallest group of atoms, ions, or molecules, whose repetition at regular intervals, in three dimensions, produces the lattice of a given crystal. See **panel on Crystal lattice**.

**unit character (Biol)** A character that can be classified into two distinct types, usually the normal and the mutant, and displaying **Mendelian inheritance**.

**unit heater (Eng)** A combination of air heater and circulator, often in the form of a heated cellular core or finned tube over which air is blown by a fan.

**unit interval (Telecomm)** In a system using an equal-length code or in a system using an isochronous modulation, the interval of time such that the theoretical duration of the significant intervals of a telegraph modulation (or restoration) are whole multiples of this interval.

**unitized (Autos)** See **chassis**.

**unit leaf rate (Bot)** See **net assimilation rate**.

**unit matrix (Maths)** A unit matrix is a square matrix satisfying the following conditions: (1) the leading diagonal entries, i.e. the entries on the diagonal from top left to bottom right, are all unity; (2) the entries not on the leading diagonal are all zero. The unit matrix of order  $n$  is an identity element for multiplication in the set of all square matrices of order  $n$ . A unit matrix is usually denoted by  $I$ .

**unit of attenuation (Telecomm)** See **decibel, neper**.

**unit of bond (Build)** That part of a brickwork course which, by being constantly repeated throughout the length of the wall, forms a particular bond.

**unit plane (Phys)** See **principal planes of a lens**.

**unit pole (Phys)** A magnetic pole which experiences a repulsive force of one newton when one metre (or one

dyne when one centimetre) apart from a like pole in a vacuum. A mathematical concept formerly used for establishing magnetic and electric units.

**unit type press (Print)** A web-fed press with one or more printing units in line on the bed plate.

**univalent (Biol)** One of the single chromosomes which separate in the first meiotic division.

**univalent (Chem)** See **monovalent**.

**invariant (Chem)** Having one degree of freedom.

**universal asynchronous receiver/transmitter (Comp)** Computer component that manages serial communication. Abbrev **UART**.

**universal beam (Eng)** H-shaped steel joists with parallel flanges with deep web and narrow flanges to carry a bending load. Maximum size 914 x 419 mm.

**universal bearing piles (Eng)** H-shaped steel joists with parallel flanges with web and flanges of equal thickness to withstand corrosion. Maximum size 356 x 368 mm.

**universal chuck (Eng)** See **self-centring chuck**.

**universal column (Eng)** H-shaped steel joists with parallel flanges which are thickened to carry an axial load. Maximum size 356 x 406 mm.

**universal combustion burner (Eng)** Natural-draught gas burner having one injector for the entrainment of primary air prior to combustion, and a secondary injector through which the flow of additional air into the combustion chamber can be regulated.

**universal grinder (Eng)** A machine in which the work rotates against a power-driven grinding wheel with the axes of both mounted parallel with a reciprocating table carrying the workhead and support tailstock. A wide range of movements and attachments allow plain and tapered external and internal cylindrical grinding and also surface grinding.

**universal indicator (Chem)** A mixture of indicators which gives a definite colour change for each integral change of pH value over a wide range.

**universal joint (Autos)** Device, usually of the modified Hooke's type, which allows rotary drive to be transmitted through an angle. Used on propeller shafts and independently suspended driven wheels to accommodate suspension movement. See **constant velocity joint**.

**universal milling machine (Eng)** A milling machine similar to a planer milling machine but with the additional feature that the table swivels horizontally, and is provided with a dividing head as standard equipment.

**universal mobile telecommunications system (Telecomm)** A set of proposals originating within the European RACE II MONET project, addressing the technical and administrative issues involved in delivering telephone and other services to a freely-roaming terminal.

**universal motor (ElecEng)** A fractional horsepower commutator motor for use with both direct current and single-phase alternating current.

**universal personal telecommunications (Telecomm)** A service currently under consideration by the European Telecommunications Standards Institute that will enable users to make and receive calls using a network-transparent personal telecommunications number, across multiple networks, to fixed or mobile terminals and irrespective of location.

**universal plane (Build)** Multi-purpose plane adaptable for rebating, grooving, trenching, cutting mouldings etc.

**universal planer (Eng)** A planer that will cut on the forward and on the reverse strokes.

**Universal Product Code (Comp)** Standard bar code now adopted in Europe. Abbrev **UPC**.

**universal resource locator (Comp)** The system of unique addresses which allows an Internet site to communicate with any other. Abbrev **URL**. See **panel on Internet**.

**universal serial bus (Comp)** A versatile bus system for PCs with about 10 times the transfer speed of older standards. Abbrev **USB**.

**universal set (Maths)** A term used to denote the set